ABSTRACT

TITLE OF THE ABSTRACT : DOES SERIAL EXIT DOSE FLUENCE ANALYSIS IDENTIFY NEED FOR ADAPTIVE REPLANNING IN INTENSITY MODULATED RADIOTHERAPY OF LOCALLY ADVANCED HEAD AND NECK CANCER?

DEPARTMENT **:** DEPARTMENT OF RADIOTHERAPY

NAME OF THE CANDIDATE : DR. BOAZ VINCENT

DEGREE AND SUBJECT : MD- RADIOTHERAPY

NAME OF THE GUIDE **:** DR. BALU KRISHNA S

OBJECTIVES:

The aim of the study is to standardize the exit fluence analyses in radiation therapy and to see whether it is a useful tool in screening out patients for adaptive re-planning.

METHODS:

The study was conducted in two parts. In part one, RANDO phantom with a custom-made tumor simulation was used to standardize the exit dose fluence pattern across setup errors and volume changes. Set-up errors were introduced at 1, 2, 3, 5 and 10mm in all 6 directions to see the gamma changes. Four volumes were created using tissue equivalent wax – 200cc, 120cc, 80cc and no volume for volume experiments. The portal dosimetry software available in the Eclipse treatment planning system (TPS)

was used to generate fluence maps and gamma analysis. The criterion used was 2mm, 2%. The expected change in area gamma values with acceptable set up error and change in volume was found.

In the second part of the study, electronic portal imaging device (EPID) based exit fluence pattern of 8 head and neck IMRT patients were captured on day 1, every 5^{th} day and last day of radiation. A CT scan with same set up used for the treatment was obtained on the last day. The change in volume of the GTV and dose variation of GTV (D_{100} and D_{95}) and critical structures were found. The change in volume was correlated with gamma values obtained.

RESULTS:

A quadratic relationship was found between area gamma values and set up errors. The area gamma values showed congruence within 95% for a set up variation lesser than 5mm in any direction. A linear trend was observed for volume changes with area gamma values. Reduction in 5% of area gamma was congruent with reduction in the volume to one-third. The patient study also showed linear reduction in the gamma values, which was proportional to the volume reduction.

KEY WORDS:

Adaptive radiotherapy, head and neck cancers, exit dose fluence, EPID dosimetry, portal dosimetry, IMRT